PRELIMINARY REPORT ON TRANSORBITAL LEUCOTOMY.*

By ALAN M. EDWARDS, M.D., M.R.C.P., D.P.M.,
Napsbury Hospital, St. Albans.

ONE'S approach to transorbital leucotomy must be critical for many reasons, chiefly that it is another blind operation with all the deficiencies this signifies. Meyer and McLardy have demonstrated the variety of anatomical sites in which lesions may be found following prefrontal leucotomy, and have stressed the variability in the position of the underlying cortex in its relations to the bony landmarks of the skull. Once more, sweeps are to be made with a blunt instrument, and the differing consistency of the brain, and perhaps its movement, will make it impossible to be certain whether the lesion produced is the size intended and in the position calculated. The dangers of intracerebral haemorrhage exist as before, and, in addition, because of the site of entry, there are chances of introducing infection, of cerebral rhinorrhea resulting from damage to the frontal sinuses, and of raising bone spicules from the orbital plate. More recently McLardy has said that with the addition of the deep frontal cut, were the caudate nuclei to be damaged bilaterally, restlessness, persisting incontinence and " delayed operative death " might occur, as may follow posterior cuts in prefrontal leucotomy.

Nevertheless, Freeman has emphasized the relative safety of this operation, and its simplicity, which allows its performance by any doctor who cares to learn the procedure. In his paper, published in the *Lancet* in September, 1948, he said that he had found the operation of value in obsessional and anxiety states, in hypochondriasis, and in cases needing maintenance shock therapy. Schizophrenic psychosis of long duration was generally a contraindication, but disturbed behaviour might be brought at least partly under control. Personality changes he had found to be slight.

At that time, there were on the male side of this hospital a large number of patients awaiting prefrontal leucotomy. The need for alterations in the operating theatre and of obtaining certain apparatus for a neurosurgeon, meant that these could not be operated on for 12 to 18 months. It seemed that in this situation a full investigation should be made of exactly to what extent this operation would be of value in mental hospital work. Only partial relief of symptoms might be obtained, but minimal blunting would leave the patients receptive to other approaches.

The *aims*, therefore, in the first place were, in a group of chronic psychotics who would normally be chosen for standard leucotomy because of symptoms such as depression, agitation, aggressive and destructive behaviour, to find (1) whether a moderate degree of change might be obtained, with some relief of distress, an improved occupational level, less nursing supervision, and perhaps

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a better ward ; and (2) whether results were an indication as to which cases would respond to further leucotomy if this was considered ; would, for example, no improvement with transorbital mean that it was not worth while proceeding to full prefrontal leucotomy ? A further aim was to become familiar with the technique and gain experience before treating better preserved and earlier cases, whom it might be hoped to render symptom-free.

Two psychiatrists (Dr. A. Probert and the author) selected cases with operations and clinical assessment done by one (A. M. E.), and anaesthetics given by the other (A. P.), and 52 cases were treated between February and August last year. The assessments of their present status were made in February and March of this year, and at that time 34 cases were 6–9 months after operation, and 18, 9–12 months.

In the July number of the *Digest of Neurology and Psychiatry*, 1949, the additional deep frontal sweep was described by Freeman, and he gave further details to the Royal Society of Medicine in September. He claimed that the operation was now as extensive anatomically, and as effective clinically, as a standard prefrontal leucotomy.

A second group of cases, 19 in number, have been treated with this modification between October, and February this year. Assessments presented were those of March to April, when 16 cases were 3–6 months after operation, and 3 cases 2 months. In deciding status the observations of ward doctors, of one or more of the nursing staff, and of occupational therapists have been used, in addition to clinical interview and examination. Cases discharged have attended hospital, and the psychiatric social worker, Miss Thomas, has visited homes to interview relatives. Symptom tables have been drawn up and scored for presence, absence, or degree of intensity on a three-point scale. The method has its limitations, but has been found of value. Only a few cases in each group have been suitable for psychological testing.

Criteria of improvement were those used in the Connecticut Co-operative Clinical study of prefrontal leucotomy, since these seemed particularly appropriate to mental hospital cases, and will afford an extra source for comparison of results, with that operation. Improvements noted are relative to the condition of the patient in the month before operation.

1. *Recovered or symptom-free.*—Patients free from subjective symptoms and showing social recovery—living at home under normal conditions and returning to their former level of useful employment. Deviations from normal premorbid personality and adjustment, though not described by the family, might still be apparent to the psychiatrist.

2. *Markedly improved.*—Subjective and objective symptoms had almost but not entirely disappeared. Patients manifested good environmental adjustment at home or in hospital, and were capable of work, though not necessarily up to former standards.

3. *Moderately improved.*—Appreciable diminution of symptoms, constituted little or no problem in care and exhibited definite improvement in either environmental adjustment or work adjustment, or both. Improvement in environment might be in the hospital, or from hospital to home.

In this category were patients who previously had been serious nursing problems, and were now able to do consistent occupational therapy or simple work in the hospital.

4. *Slightly improved.*—Indicated no change in environmental or work adustment and only slight improvement in symptoms. The problems of management were reduced somewhat, but the patients still required careful supervision. Troublesome

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features such as violent and destructive tendencies, or food refusal may have been lost.

5. *Unimproved.*—No change.

6. *Worse.*—Exacerbation of previous intractable behaviour or increase in subjective symptoms.

The term Significant Improvement will be used to group together Recovered, Markedly and Moderately Improved. It does not imply a statistical significance.

It would seem most probable that cases showing slight improvement will relapse in time, and grouping is therefore with Unimproved.



FIG. 1.—Base of brain showing sites of entry.

TECHNIQUE.

Penicillin drops (1200 units per c.c.) are put in the eyes two or three times the day previously, and again on the morning of the operation. Any case with inflammation of the conjunctiva is rejected.

Pre-operative atropine 1/100 grain is given, and as a sedative intramuscular paraldehyde or rectal avertin. Face and forehead are swabbed with dilute Dettol solution. Intravenous pentothal is used for anaesthesia in preference to E.C.T. Sterile gloves, masks and gown are worn, and sterile towels clipped round the scalp and placed over the nose and mouth. A nurse holds the head firmly. Although there has been no case with injury to the frontal sinuses, it was decided after the first few months to take routine antero-posterior X-ray of these sinuses, which are followed by lateral views if these should be unusually large.

Transorbital leucotomes made by Down Bros. and H. A. Ator have been used. The latter have been preferred because of their lightness, small handles and sharper points.

The operative details in both operations are exactly as described by Freeman.

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Original method.—The eyelid is raised and the leucotome introduced centrally above the eye into the superior conjunctival sac and directed against the orbital plate at the point of greatest convexity. This is approximately 3 cm. from the middle of the skull and 2 cm. behind the superior orbital ridge. The shaft is in the plane of the nasal bone.

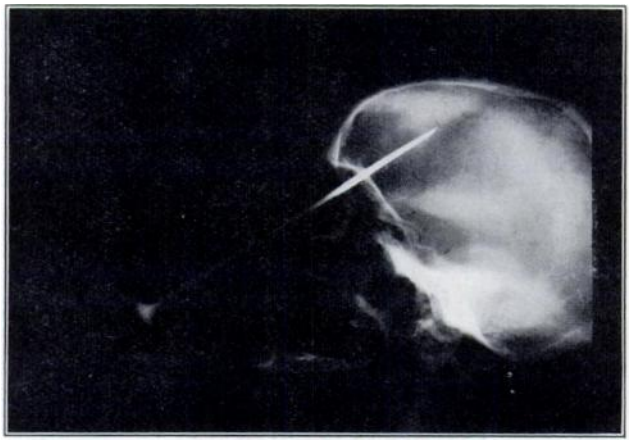


FIG. 2.—X-ray with leucotome driven in to furthest point.

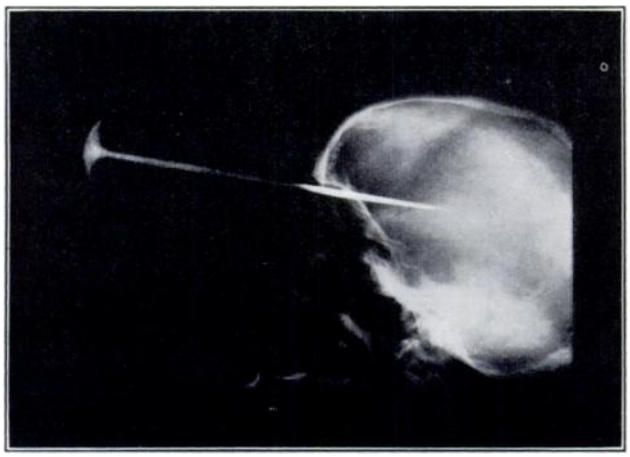


FIG. 3.—X-ray after deep frontal cut.

It is driven in to a depth of 4 cm., as noted by the upper eyelid, with gentle taps of a wooden mallet, and the handle is then drawn laterally until it reaches the lateral margin of the orbit. It is returned to the middle position and driven in further to 7 cm., always in the plane of the bony ridge of the nose.

The handle is then moved gently 15 to 20 degrees medially and then to the same angle laterally—returned to the mid-line and withdrawn rapidly.

There is great variation in the thickness of the orbital plate. Some are

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so thin that the slightest pressure drives the point of the instrument through, whilst others are extremely hard. In one case, though not in this series, it was impossible to angle the instrument on one side.

The Deep Frontal Sweep.—The introduction of the instrument is at the same site and in the same plane as before, but the first wide lateral sweep to the margin of the bony orbit is made at 5 cm. instead of 4. The leucotome is then returned to an oblique position with a slight medial inclination and driven in to 7 cm. It is then moved 20 medially and 30 laterally, and the handle in the latter position is raised in this oblique plane until it meets the superior orbital ridge. The handle is returned to the parasagittal plane, lowered a fraction, and then withdrawn rapidly.

The full sweep in this deep frontal sweep is sometimes hindered by the toughness of the orbital plate.

A pad is held firmly over the upper eyelid after the withdrawal of the leucotome, and then bandaged over the closed eyes. The pads are removed when the patients regain consciousness. They are allowed to sit up in bed gradually, if they wish, 6 to 8 hours after operation, and are out of bed the following day—going to occupational therapy on the second or third day.

Pulse, temperature, blood pressure and respiration rate are observed regularly during the first 24 to 36 hours, as following prefrontal leucotomy.

RESULTS WITH ORIGINAL TRANSORBITAL LEUCOTOMY. (52 *Cases*).

	Number of cases.	Significant improvement.
Schizophrenia.		
Paranoid	18	5
Paraphrenia	8	1
Catatonic	7	2
Hebephrenic	6	0
Mixed reactions	3	0
Affective Disorder.		
Depressive psychosis	1	1
Severe chronic anxiety neurosis	1	1
Chronic mania	1	1
Hypochondriasis	3	1
Obsessional disorder	2	0
Epilepsy	2	0
Combined Results :		
Significant improvement	11	
Slight improvement or unimproved	39	
Worse	1	
Death	1	
(Discharged home)	8	

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The temperature is usually about 99° in the evening of the operation day. Originally, Sulphatriad, 3 gm. and later 4 gm., was given daily for the first two days prophylactically, but more recently this has been replaced by 600,000 units of oily penicillin, given at the same time as pre-operative atropine, with 300,000 units the following day. If temperature rises above 99°, sulpha drugs and penicillin are used together in increased doses, but this has been necessary only on 3 occasions.

Headaches are not frequent, and then only slight and of short duration.

Bruising round the eyes and swelling of the lids is usual, but the latter subsides within 2 to 3 days, and bruising fades and disappears within 1 to 2 weeks.

Paranoid Schizophrenia.—18 *Cases.*

Significant improvement 5 (1 discharged ; 1 other possible discharge shortly).

Duration of Present Illness.		*Status.*	
Under 2 years	1	Moderate improvement	5
2–5 years	7	Slight improvement	5
5–10 years	3	Unimproved	7
Over 10 years	7	Died	1

The patient discharged, a man of 32, had been ill for 13 years, during which time he had been in hospital on many occasions and had had full insulin coma therapy and E.C.T. with only slight response. There appeared to be a periodicity in the severity of his symptoms. Whilst in here he was extremely agitated and apprehensive, with persecutory delusions and hallucinations, and continual impulsive violence. E.C.T. had brief effect. He made progress following leucotomy in August and left hospital in November. He lives a solitary existence at home, and is afraid to mix socially with people apart from his family, as he fears he might attack them. He goes for walks, and visits the library and cinema, and more recently rides his motor bicycle again. He shows affection for his mother and father, talks more readily than before, is even-tempered and equally particular about his appearance. He has lost his fears of the dark.

Improved patients remaining in hospital show a more friendly manner and are less suspicious, though delusions and hallucinations and some irritability remain. Depression, food refusal and self-injury are nearly always relieved, and noisiness greatly diminished.

Aggressive behaviour is at present absent in half the cases who had shown it previously. Experience with some of the early cases shows that these may relapse after 9 to 12 months.

Severe destructiveness may be diminished, but does not go entirely.

Two cases who had not worked for years have been usefully occupied since, one, in addition, playing the saxophone in the hospital band.

A brief exacerbation of impulsive violence 5 weeks after operation was seen in a patient who had not displayed this for 7 years. The operation was done at a time when he had be un to deteriorate.

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Paraphrenia.—8 *Cases.*

Significant improvement, 1 case (1 discharged).

Duration of Present Illness.		*Status.*	
Under 2 years	1	Markedly improved	1
2–5 years	5	Moderate improvement	0
5–10 years	2	Slight improvement	4
		Unimproved	2
		Worse	1

The case discharged was a man of 47 with mild diabetes, whose psychosis had been developing for 7 years. Following leucotomy in April, he was cheerful, and occupied from the first.

Aural hallucinations subsided 6 weeks afterwards, and when he left hospital 5 weeks later, delusional ideas were still there, but he referred to them much less. He has obtained a position as a commercial traveller, and is doing well. His wife reports no change in him except that he gets tired more easily. He is sociable, has taken up his former interests, reads heavy literature, and has unimpaired concentration. Mood is cheerful and shows little variation. He is still sensitive to other people's distress.

In the others there is reduced tension and suspicion, and relief of noisiness and abusiveness. Hallucinations and delusions remain. Obsessional thoughts in one, and hypochondriacal in another, are less distressing. In one case with depression and obsessional symptoms, delusions and hallucinations are more florid.

One patient showed improved response to E.C.T. after operation, and another has had great relief of an intractable pruritus ani.

Catatonic Schizophrenia.—7 *Cases.*

Significant improvement, 2 (1 discharged).

Duration of Present Illness.		*Status.*	
Under 2 years	1	Moderate improvement	2
2–5 years	3	Slight improvement	1
5–10 years	2	Unimproved	4
Over 10 years	1		

An impulsively violent, suicidal and destructive man aged 34, who had been ill for 7 years, and for 4 years was nursed on and off in a padded room for long periods with heavy sedation, has worked consistently since operation one year ago. In the last 2 months he began to show phases when he was tense, and aggressive in manner to other patients, and has had transorbital repeated with the deep frontal cut within the last week to prevent full relapse.

A man aged 27, with a psychosis of 3½ years' duration, who had had 2 courses of insulin coma, and much E.C.T., but continually relapsed into stupor, with occasional violence, was only slightly improved, until about the fifth month when he brightened, and was able to be discharged home a month later, though still showing retardation.

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Hebephrenia.—6 *Cases.*

Significant improvement—*nil.*

Duration of Present Illness.		*Status.*	
2–5 years . . .	1	Slight improvement .	3
5–10 years . . .	3	Unimproved . . .	3
Over 10 years . .	2		

Impulsiveness, overactivity, resistiveness, destructiveness and interfering behaviour are the symptoms that have been influenced. One, unemployed for 5 years, though incoherent and hallucinated, did heavy manual work for 11 months, with a greatly diminished destructiveness and then relapsed completely. Transorbital has been repeated recently with the deep frontal cut.

Of 3 cases of schizophrenia not falling into the previous groups, showing mixed reactions with marked depressive features, 2 are slightly improved and the other unchanged. All were between 2 and 5 years' duration.

Suicidal thoughts and self-reproach disappeared, but schizophrenic symptoms were unaltered.

One patient, though not depressed, refusing food, or attempting to injure himself now for 2 months, occasionally handled his faeces openly and put them in his mouth 5 months after operation. This behaviour was associated with delusions he had had previously of being changed into an animal. A shy, sensitive young man of 27 still had ideas of reference, is less depressed, lives at home, and is now able to go about by himself.

Percentage of Male Cases of Schizophrenia Discharged, Recovered or Improved.

	Board of Control figures for 1000 cases of prefrontal leucotomy. (%).	Original transorbital leucotomy (41 cases). (%).
Under 1 year .	62·5 .	(Only 1 case)
2–4 years .	26·9 .	10·5
5–9 years .	15·5 .	10
10–19 years .	17·1 .	10

These figures are presented quite tentatively, are based on small numbers, and would, of course, need a more detailed analysis before presenting a true comparison of the results of the two operations. For example, none of the transorbital cases have recovered and there are no control group figures.

Affective Disorder.—3 *Cases.*

(2 recoveries; 1 unimproved).

Case 1.—A depressive psychosis in a married man of 41, a clerical worker with a mildly obsessional personality, who began to develop tension and depression when he was called to the Navy in 1943. He managed to keep going for a year, with sedatives and reassurance, but was then admitted to hospital and received

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E.C.T., and was later invalided. He continued to feel depressed and anxious, slept poorly and occasionally had suicidal ideas, but worked until admission in March, 1948. With E.C.T. he became superficially improved, but depressive ideas and tension remained. He left against advice, but was shortly readmitted with intense depression, agitation, suicidal ideas and delusions of guilt, with self-accusation. Leucotomy was performed in April last year. He claimed relief from the first, but his ideas were of a depressive nature for another 6 weeks. He left hospital 2 months afterwards, cheerful, but showing some tension. Because of his history he had difficulty in getting clerical work, as he would only try for pensionable jobs. He found a position as a gardener eventually, in a park, his father's occupation. His wife says she sees no change in his personality. He is affectionate, responsible, and resourceful, and not as obsessionally tidy as before. Clinically he appears recovered. Psychological testing has been done, but results are inconclusive.

CASE 2.—A severe chronic anxiety neurosis of 9 years' duration in a man of 33, with paranoid traits in his personality. Symptoms developed following capture by the enemy in 1940, and escape, and a period in a Spanish concentration camp, but he did not report sick until 1944. He was discharged after treatment in a neurosis centre, and was later admitted to Sutton Emergency Hospital and Shenley. He had modified insulin, continuous narcosis, abreaction with ether, and daily psychotherapy. Tension, irritability, poor sleep, paranoid feelings and fits of depression with suicidal ideas continued. He was advised to have leucotomy, but refused. Symptoms continued and were accompanied by rages, and constant demands for intercourse with his wife.

In 1949 he was charged with handling his daughter's genitals, and mental hospital treatment advised. He made no response to modified insulin and sedation.

Transorbital leucotomy was done in July, 1949.

He was immediately relaxed afterwards, ate and slept well, could concentrate to read, managed without sedatives, and was discharged in October, still symptom-free. He found work in a few weeks as a van driver, and has continued at this since. He is on much better terms with his wife, is considerate at home and generous. He plans for the children, and is looking for a better job. He is able to read and concentrate, and says, " I'm not always looking for trouble. I haven't got that spitefulness. If I get upset it's only for five minutes, where before I used to brood for days." There have been no dreams since operation.

On one occasion when he was alone with his daughter, 2 weeks after leaving hospital, he made a tentative approach to her, but there has been no further incident like this.

Recently, psychological tests by Mr. Price (8 months after operation) seem to indicate a slight degree of intellectual deterioration. Clinically he appears recovered.

CASE 3.—Chronic mania, in a man of 48, which had not responded to E.C.T., remains virtually unchanged. He is slightly less impulsive and interfering than previously.

Hypochondriasis.—3 *Cases.*

1 moderate improvement ; 2 unimproved.

CASE 1.—A man of 31, who had had hypochondriacal symptoms for 10 years. He had frequent periods away from work, complained of a variety of pains all over his body, with dizziness, headaches, insomnia, irritability, fears of infection, and insanity, and obsessional brooding. He was admitted twice as a voluntary patient. Leucotomy was in August, 1949. Phobias and tension were relieved, and ability to concentrate improved. He remained very hypochondriacal until about the fifth month afterwards when complaints began to decrease noticeably. He has left hospital recently and hopes to start work again shortly. The degree of improvement is moderate.

His wife noticed that in these early months he was more irritable, more argumentative and ready to use bad language. He is still indecisive and mildly obsessional. The setting of the syndrome was one of constitutional inferiority and chronic anxiety.

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CASE 2.—A single man of 40, who had never kept a job for long and was discharged from the Army after 5 weeks, with " nervous and gastric trouble," in 1942. He worked spasmodically for a short time but continued to complain of numerous symptoms, and was always going to hospitals asking for investigations. He had 3 admissions to this hospital, for varying periods, when he was continually demanding X-rays, restless and agitated, saying he was driven mad by his pains. He had several courses of E.C.T. with only temporary effect. He stopped everybody he met, pleading his case, demanding sedatives constantly, and beat on his sideroom door at night calling for medical help.

Leucotomy was in February, 1949. For 6 months he was less insistent, slept well and put on weight, but then gradually relapsed to his former state. The reaction was of psychotic degree, the aggressive nature of the hypochondriasis allying it prognostically with the paranoidal psychoses.

CASE 3.—A single man of 57 who, for 6 years, had been miserable and full of complaints of pain and tension in head, neck and limbs. He had been 2 years in hospital, showing extreme hypochondriasis, agitation, loud coughing, and continual movements of his mouth. E.C.T. had, unfortunately, resulted in an impacted fracture of the neck of the femur on the second occasion. This had been pinned. The operation was in August, and there has been no improvement. The setting is that of a chronic depressive psychosis with hysterical features.

Obsessional Disorder.—2 Cases.

Both cases remained unimproved.

CASE 1.—A single man of 33, with a schizoid personality, suffering from a severe chronic obsessional disorder. He had his first breakdown at 12, and then again at 19 with obsessional thoughts of guilt and indecision, and these had continued, with fluctuating depression, suicidal thoughts, headaches, and great tension. He had only temporary relief with concentrated E.C.T. and maintenance E.C.T.

Relief after operation was only for 2 days.

Symptoms were exacerbated in the first 2 months, and he was unimproved.

CASE 2.—An obsessional disorder of 12 years with post-encephalitic Parkinsonism. An anxious agitated man, demanding treatment because of distressing thoughts of murder and suicide. Unimproved.

Epilepsy.

Two violent unemployed patients, who had been in hospital between 5 and 10 years, were able to attend occupational therapy for a few months and then relapsed.

Complications.

1. One death from an intracerebral haematoma in the left frontal lobe. The patient died 7 days after operation. The brain was sent to the Maudsley Hospital who have given us the accompanying photographs, Figs. 4 and 5. The first shows the haemorrhage on the left side, the second is a section through the other frontal lobe at the site of the medio-lateral sweep.

2. One major seizure in a patient 8 months after operation.

3. A patient collapsed in the lavatory 7 days after operation and was found unconscious, but recovered within a few minutes. It is possible that he had a fit, but there is no definite evidence of this. He later had giddy feelings on rising in the morning 5 weeks afterwards, which cleared after 2 weeks.

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4. Another patient was febrile for 4 days after operation and appeared apathetic during this time. No definite cause was found for this. Recovery was uneventful. There has been no alteration in his psychosis.

5. No cases were incontinent.



FIG. 4.—Intracerebral haematoma in the left frontal lobe.



FIG. 5.—Section through the other frontal lobe, at the site of the medio-lateral sweep.

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Personality Changes.

As the majority of this group were chronic psychotics, and discharges a mere handful, the opportunities of assessing personality changes fully have been few. Nevertheless, it emerges fairly consistently that these are slight. The patients are alert, talk readily, though not perhaps at previous length, and show initiative. They have found positions for themselves on discharge in spite of difficulties. Affective response is good, and concentration unimpaired.

Dreams are diminished in number and more difficult to recall.

Irritability was more noticeable in one case.

No patient has developed inertia, apathy, callous or explosive behaviour.

Psychological testing seems to reveal no deterioration or slight degrees, which may still be detected 8 to 12 months afterwards.

Conclusions.

1. Original transorbital leucotomy is of most value in the treatment of agitated depression and severe chronic anxiety neuroses which have failed to respond to other methods.

2. Hypochondriacal syndromes may be relieved if in a setting of chronic anxiety.

3. In schizophrenic psychoses of over two years' duration results are disappointing. No case has been rendered symptom-free. Improvements can be obtained in half the cases, but two-thirds of these are slight, and the other third only of moderate degree. Relapses are frequent after short periods of encouraging improvement. Response was best in paranoid and catatonic groups.

Depressive symptoms can be relieved, but occasionally delusional ideas become more prominent.

Exacerbations of the psychosis occur in a minority for short periods during the first to third months.

4. Severe obsessional disorders and epileptic psychoses are uninfluenced.

5. Personality and intellectual defects are slight.

6. Response to E.C.T. may be improved after operation.

RESULTS WITH TRANSORBITAL LEUCOTOMY WITH DEEP FRONTAL CUT.
(*October*, 1949, *to February*, 1950.)

19 cases. Significant improvement, 6 (5 discharged,).

	Number of cases.	Number showing significant improvement.
Schizophrenia :		
Paranoid	9	3
Paraphrenia	1	0
Catatonic	3	0
Obsessional disorder	3	1
Hypochondriasis	2	2
Epilepsy	1	0

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Schizophrenia.

13 cases. Significant improvement, 3 (1 discharged,).

	Paranoid, 9.	Paraphrenia, 1.	Catatonic, 3.
Duration of Present Illness.			
Under 2 years	1	0	0
2–5 years	0	1	1
5–10 years	5	0	2
Over 10 years	3	0	0
Moderate improvement	3	0	0
Slight improvement	4	1	1
Unimproved	2	0	2

These cases were the tail end of the original selected group and were those that one felt less chance of influencing. Eight of the nine paranoids were over 5 years in duration. The type of symptoms in which alteration has occurred were much as before. Tension, anxiety, depression, noisiness, and food refusal have responded well. Five of the seven patients who were violent have shown no aggression as yet, and proportions are approximately the same for impulsiveness. Two have had exacerbations of their psychotic behaviour for short periods. One man, with a psychosis of 27 years' duration in association with confusion and apathy, was incontinent of urine and faeces for one month, starting 3 weeks after operation, with one isolated occurrence 2 weeks later. Confusion cleared and he is now leading a solitary routine existence at home, going for walks and helping in the house when prompted. He shows diminished tension, and has gained weight.

A very suspicious, agitated patient with florid delusions and hallucinations, who had the original operation in July last year and showed a moderate degree of improvement for 4 months, then relapsed, was operated on again in February, and again shows a more relaxed friendly attitude, though delusions and hallucinations are as previously. The impression gained so far is that this operation is more effective than the original.

Hypochondriasis.

Both the cases in this group presented severe and prolonged hypochondriacal syndromes in a depressive setting, and have left hospital improved, one symptom-free.

CASE 1.—A married man of 51, who had had hypochondriacal symptoms for 24 years with fluctuating depression and occasionally suicidal ideas. A course of E.C.T. in 1945 had lifted the depression, but left his somatic complaints as before. He had been unable to work for a year, and had been in hospital previously as a voluntary patient during this time. He could speak of little but his headache, backache, insatiable thirst, dizziness and fainting sensations, and the feelings that his stomach was "always on the churn," with gas moving about his abdomen. Since leucotomy, 5 months ago, he has been greatly improved, left hospital after 2 months and is now symptom-free. He is cheerful and energetic, and says he

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can eat a normal diet. His wife says the degree of his affection for her seems unaltered, but he is irritable and abrupt on occasions. He is not as talkative as previously. Continues to read regularly as before. He has arranged their removal to a district where there is more opportunity for work. He says that he was " a little more sentimental " before, and " I can't get as close in feeling to my child."

He has no dreams. He has never had much interest in the opposite sex, and his almost complete impotence and lack of desire is unaltered.

The Rorschach has been done by Mr. Wheeler before, and at 1 and 4 months after operation. Hypochondriacal tendencies were absent in both post-operative records. At 1 month speed and spontaneity were reduced and output decreased. Phantasy content suggested a less childish, but more rigid personality. Susceptibility to environmental influence had been low in the pre-operative test, but was now even less. At 4 months reaction time was more rapid than on both previous occasions. There were still signs of immaturity, but more balance, less tension, and greatly increased social adaptation. There were some indications of stubbornness.

CASE 2.—A married women of 41 with a severe obsessional neurosis which had started 8 years previously after birth of her child, with obsessional impulses to attack and strangle the child and other people. She had not been able to be left alone, and for 3 years she had had to be with her husband continuously, travelling with him in his work and acting as secretary. She had feelings of depression tightness in her head, and had treatment with E.C.T. in 1947–48, and then one year's analysis, which included narco-analysis and sessions with ether abreaction, with no improvement.

Operation in January this year.

During the fortnight she was in hospital and afterwards she was at ease, and greatly improved. After her return home she continued to feel better and not disturbed by her obsessional ideas which only occurred occasionally. She had not the confidence to go about by herself and within 3 weeks had relapsed to her former condition, and complained for about a month that she had less energy than previously. Rorschach, done by Miss Alcock one month after operation, showed definite traces of organic impairment of a frontal lobe type. These included excessively long reaction times and total time relative to the number of responses. The latter were few, with some perseveration, use of undifferentiated texture, some difficulty in shifting concepts, and personal references.

There was evidence of tension.

Follow-up continues, and Rorschach will be repeated 6 months after operation.

CASE 3.—A young man of 26, with an obsessional personality and life-long shyness, self-consciousness, lack of spontaneity, obsessional rumination and abnormal awareness of all his body movements, and a feeling that he was " forcing " himself about. Eighteen months prior to operation he became depressed and disturbed, with an acute onset of depersonalization. He felt outside himself, and speaking through his face. He felt he could see himself from all angles. Things and people looked flat and dull and only occasionally alive momentarily. He had 3 previous admissions to mental hospitals, and had received insulin coma therapy and 2 courses of E.C.T. with benefit. He had 5 weeks' exploratory psychotherapy, producing much material, and over 180 paintings with no improvement. He had difficulty in concentration and was unable to work.

Leucotomy was done in February.

He left after 3 weeks, and is at home awaiting a vacancy for an art school. He feels relief of tension, is more able to concentrate, and freed of his body awareness and self-watching. He still complains of lack of spontaneity and of feeling out of things. He dreams, but is unable to remember them though he makes an effort. The number of his paintings are much fewer, and his associations less in psychotherapeutic interviews which have continued. There is no discernible change in personality.

Psychological tests by Mr. Price, 2 weeks after operation, showed no significant alteration in scores. Speed and fluency, which had been a feature of pre-operative tests, were unaltered. There appeared a suggestion that he was rather less careful.

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Rorschach testing was done before operation and again 9 days afterwards by Miss Alcock. It was abnormally long and strongly obsessional on both occasions and showed no significant change. General improvement appears to be moderate.

Complications.

1. Two major fits in one patient, 2 days after operation with none in the 6 months since then.

2. Incontinence of urine and faeces for one month, starting 3 weeks after operation and associated with exacerbation of psychosis, with an isolated incident 2 weeks later.

3. A rise of temperature on third and fourth day after operation, with no definite cause.

Amongst an additional group of 13 cases of transorbital leucotomy with the deep frontal cut, done at the invitation of another mental hospital, there was one death.

A paraphrenic patient became febrile 4 days after operation, and on the fifth day had signs of pneumonia and a meningitis which was pneumococcal, and died 2½ weeks later. At post-mortem there was a bronchopneumonia with a lung abscess in the left lower lobe, meningitis and an abscess in one frontal lobe. The holes in the orbital plate were normal. No air sinuses had been pierced.

Owing to a misunderstanding regarding post-operative treatment, the first 8 cases did not receive prophylactic sulphonamides, and this was probably a factor in the development of the infection. There have therefore been 2 deaths in 84 transorbital operations, a mortality of 2·3 per cent.

[I have been informed that in this group significant improvements have been obtained in depression. severe anxiety neurosis, and in an acute schizo-affective psychosis of approximately 2 years' duration. These cases had not responded to other treatments. An obsessional disorder of 3 years' duration improved, but one of 12 years' was unaltered.]

Conclusions.

The main questions posed by the operation appear to be :

1. What is the relative effectiveness in relation to standard prefrontal leucotomy ?

2. If no improvement at all is obtained following transorbital with the deep frontal cut, is it worth while advising further leucotomy ?

3. If a good response is obtained, followed by a relapse after some months, can the same operation be repeated with safety and a more lasting result, or should standard leucotomy be advised ?

Tentative conclusions from experience so far are :

1. The deep frontal cut renders this operation more effective clinically than the original method.

2. Complications are few, and personality and intellectual defects still slight.

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3. It is of most value in depression, anxiety and hypochondriasis in a depressive setting.

4. In obsessional disorder it is of no value unless in the first 2–3 years.

5. In long-standing cases of schizophrenia the value is as yet problematical. Improvements have been obtained, but it has yet to be seen whether these will last. It appears worth while, however, continuing to try transorbital in the first place if leucotomy is decided on, except in the aggressive deteriorated patients.

6. Finally, the clinical impression gained, taking into account all results to date, is that the relative effectiveness of original transorbital leucotomy is one-third, and with the deep frontal cut, two-thirds that of prefrontal leucotomy. No doubt this will need reviewing and modification in the light of later results.

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